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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/763,068	01/22/2004	Xiaogang Peng	40715-296579	3712

23370 7590 06/25/2009

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EXAMINER	
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ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
06/25/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/763,068	PENG ET AL.	
	Examiner	Art Unit	
	Elena Tsoy Lightfoot	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 June 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-57,59,60,63-98 and 100-109* is/are pending in the application.

4a) Of the above claim(s) *1-57,69-98 and 100-108* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *59,60,63-68 and 109* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 18, 2009 has been entered.

Response to Amendment

Amendment filed on June 18, 2009 has been entered. Claims 58, 61 and 62 have been cancelled. New claim 109 has been added. Claims 1-57, 59, 60, 63-98, and 100-109 are pending in the application. Claims 1-57, 69-98, and 100-108 are withdrawn from consideration as directed to a non-elected invention.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Rejection of claims 58-68 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement has been withdrawn due to amendment.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Rejection of claims 58-68 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been withdrawn due to amendment.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 59, 60, 63-68, and 109 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reiss et al (*Nano Letters,* 2 (7), 781 -784, 2002).

Reiss et al discloses a method for preparing CdSe/ZnSe (claimed formula M^1X^1/M^2X^2) core/shell nanocrystals having impressively high photoluminescence (PL) efficiency (See Abstract) comprising slowly injecting a mixture of a solution of ZnO complexed with dodecy**phosphonic** acid or zinc stearate in toluene as the zinc precursor and a solution of TOPSe (Se-trioctylphosphine) in TOP into a solution of CdSe core nanocrystals in HAD (hexadecylamine)/TOPO (trioctylphosphine oxide) (See page 781, second paragraph) (See page 782, second paragraph, page 783, reference (24)).

Reiss et al fails to teach that the shell is formed by applying a cation (M^2) precursor and an anion (X^2) precursor) separately from each other in an alternating manner (Claims 59, 109).

However, it is held that selection of any order of mixing ingredients is considered to be prima facie obvious (In re Gibson, 39 F.2d 975, 5 USPQ 230 (CCPA 1930). See also In re

Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added a zinc precursor to CdSe core nanocrystals, followed by addition of a Se precursor in Reiss et al, as required by claim 59, the expectation of providing the desired CdSe/ZnSe core/shell nanocrystals in the absence of showing of criticality.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to have added a Se precursor to CdSe core nanocrystals, followed by addition of a zinc precursor in Reiss et al, as required by claim 109, the expectation of providing the desired CdSe/ZnSe core/shell nanocrystals in the absence of showing of criticality.

As to claim 63, Reiss et al teaches that structural defects in the shell low fluorescence quantum yield (See page 781, paragraph 1). Obviously, any impurities would act as structural defects in the shell. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have purified a core/shell nanocrystal in the cited prior art with the expectation of providing the desired maximum fluorescence quantum yield.

7. Claims 58-60, 63-68, and 109 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reiss et al, as applied above, and further in view of Nicolau (US 4675207).

Reiss et al fails to teach that the shell is formed by applying a cation (M^2) precursor and an anion (X^2) precursor) separately from each other in an alternating manner (Claims 59, 109).

However, Nicolau teaches that deposition of compounds of formula C_mA_n (wherein C represents a cation, A represents an anion) to a substrate of *any* type of materials (See column 5, lines 63-69) in solution by providing cationic and anionic constituents in an alternating manner permits deposition of monocrystalline or polycrystalline, fault-free, compact layers of the

compounds having *homogeneous* thickness and desired *stoichiometry* of the deposited compounds in contrast to the presently known deposition in solution with (simultaneous) addition of cationic and anionic constituents (See column 2, lines 22-35) because slow heterogeneous chemical reactions (i.e. at the substrate-solution interface, See column 3, lines 6-9) not coinciding with the homogeneous chemical reaction producing a precipitate can only be used with certain chalcogenides and metals (See column 2, lines 30-35). Nicolau further teaches that the two superimposed ionic layers respectively containing the cationic constituent C and the anionic constituent A are formed by successive immersions of the substrate in a first solution containing cationic precursor and a second solution anionic precursor, said substrate undergoing **rinsing** by a solvent between two immersions (See column 3, lines 21-40). Thus, rinsing after immersing the substrate into cation precursor solution (that removes the cation precursor solution from the substrate) prevents cation and anion to coexist thereby preventing local nucleation on the substrate or in the solution so that desired fault-free, compact layers of *homogeneous* thickness and desired *stoichiometry* of the deposited compounds are obtained. Note that claims 59 and 109 do not recite a negative limitation that rinsing steps should be absent.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to prepared M^1X^1/M^2X^2 core/shell nanocrystals of Reiss et al using a deposition in solution with providing cationic and anionic constituents in an alternating manner with the expectation of providing the desired monocrystalline or polycrystalline, fault-free, compact layers of *homogeneous* thickness and desired *stoichiometry* of the deposited compounds, as taught by Nicolau.

As to performing immersion of a substrate in the same vessel, Nicolau teaches that according to a first embodiment of the process, at least one cycle consists of the of the following successive stages:

immersion of the substrate in a first solution of a salt, a complex or an ionized compound of said cationic constituent,

rinsing the substrate with a solvent,

immersion of the substrate in a second solution of a salt of a compound or an ionized complex of said anionic constituent, and

rinsing the said substrate in a solvent. (See column 3, lines 42-53).

As could be seen from the above, Nicolau does not require any specific number of vessels as long as all required steps are performed. Therefore, it would be obvious to one of ordinary skill in the art to carry out the immersion of a substrate in cation and anion solutions in alternating manner and rinsing in any possible ways: either in separate vessels or by adding the cation precursor solution and the anion precursor solution in an alternating manner, and rinsing in the **same** reaction vessel, as required by claims 59 and 109 (e.g. adding a cationic solution to a vessel, removing the cationic solution from the vessel, rinsing the substrate in vessel, removing water after the rinse, adding an anionic solution to the vessel, and then immersing the substrate into the anionic solution).

As to claim 63, Reiss et al teaches that structural defects in the shell low fluorescence quantum yield (See page 781, paragraph 1). Obviously, any impurities would act as structural defects in the shell. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have purified a core/shell nanocrystal in the cited prior art with the expectation of providing the desired maximum fluorescence quantum yield.

As to claim 65-68, Nicolau teaches that precursors for the formation of ionic layers on substrates including monocrystalline metallic substrates, e.g. of Zn or Cd, monocrystalline semiconductor substrates, e.g. of Ge, GaAs or InP (See column 6, lines 3-10), are preferably salts such as **zinc suphate** (See column 9, line 64), complexes or compounds *dissolved* in any solvent, e.g. water, organic solvents or mixtures of the water and organic solvent, where the salts, compounds or complexes present in these solutions can be in the dissociated state (See column 6, lines 14-36). In the solutions, the cationic or anionic constituents can be present in the form of a **complex** with an appropriate ligand, e.g. **ammonia**, which is soluble in the solution (See column 6, lines 30-33).

As to claim 109, Nicolau teaches that the arrangement of the cationic and anionic layers with respect to the substrate is dependent on the nature thereof and it is consequently possible to have either the cationic layer or the anionic layer in contact with the substrate (See column 3, lines 16-20).

Response to Arguments

8. Applicants' arguments filed June 18, 2009 have been fully considered but they are not persuasive.

Reiss et al in view of Nicolau

(A) Applicants submit that the combination of Reiss and Nicolau does not teach all the limitations of claim 59. As recognized by the Examiner, Reiss discloses a one-step method for the production of core/shell nanocrystals wherein the cation precursor and the anion precursor solutions are simultaneously added to a solution of core nanocrystals. Nicolau also fails to teach the limitations of claim 59, wherein the cation precursor solution and the anion precursor solution are added to the same reaction vessel in an alternating manner. Nicolau discloses a method of immersing a unitary substrate in independent salt solutions with rinsing between immersions.

The argument is unconvincing because adding the cation precursor solution and the anion precursor solution to the **same** reaction vessel in an alternating manner would be within the level of ordinary skill in the art.

(B) Applicants submit that Nicolau actually teaches away from adding cation precursor solution and anion precursor solution into the same reaction vessel in the production of core/shell nanocrystals. As provided above, Nicolau teaches separation of the cation precursor solution from the anion precursor solution by requiring independent solutions of cation precursor and anion precursor. Nicolau additionally requires that the substrate be rinsed between immersions in the separate cation and anion precursor solutions. Rinsing between immersions is fundamentally inconsistent with and teaches away from adding cation precursor solution and anion precursor solution into the same reaction vessel in the production of core/shell nanocrystals.

The Examiner respectfully disagrees with this argument. First of all, claims 59 and 109 are open-ended and do not exclude rinsing steps. Second, claims 59 and 109 do not recite a *negative limitation* that rinsing steps should be absent. Third, Nicolau does not teach that addition and rinsing steps should be carried in at least two vessels. Therefore, one of ordinary skill in the art would easily recognize that adding the cation precursor solution and the anion precursor solution in an alternating manner with **rinsing** between the addition steps may be performed either in two vessels or addition and rinsing steps can be carried out in the **same** one reaction vessel.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elena Tsoy Lightfoot whose telephone number is 571-272-1429. The examiner can normally be reached on Monday-Friday, 9:00AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elena Tsoy Lightfoot, Ph.D.
Primary Examiner
Art Unit 1792

June 25, 2009

/Elena Tsoy Lightfoot/